the spectrum became sigmoid shaped and that the slope at the inflection point increased with respect to the slope of the graph of Fig. 1. It is evident from my Figs. 1 and 2 that the SEM's of the data points are too small to obviate these conclusions.

It should be pointed out also that the integration period for the individual measurements comprising the data points of Fig. 2 was, by virtue of the time compression method, 40 min, not the 5 min discussed by Fishman and Dorset. Fig. 4 which does contain the results of single measurements, rather than the means of many, does not display anything like the degree of scatter Fishman and Dorset envision. Fortunately, too, since fluctuation spectra are plotted logarithmically the graphic effect of data variability diminishes greatly.

I employed the porous glass disk solely as a temperature transducer—not, as Fishman and Dorset state, for a "check of [my] measurement system. . . . ." My somewhat gratuitous conclusion that its noise was "about equal to the theoretical Johnson noise . . ." was certainly not intended as a definitive generalization covering the electrical fluctuations of electrolyte systems. I regret any inconvenience or misconception caused by that statement.

Ouabain does have an effect on the fluctuations of frog skin. The data of par. 4, p. 1379 and par. 2, p. 1380 show that the fluctuations attributed to the current flow arising during active transport vanish when the skin is treated with ouabain, but that those of the skin's electrical resistance do not. The possible relationship of both of these findings to the mechanism of active transport, particularly carrier-mediated transport, is treated in detail in par. 3, p. 1386, *et seq.*

Reasons for concluding that the fluctuations I observed reveal the mechanism of active transport are discussed in full throughout my paper. That some inorganic membranes, under appropriate conditions, generate noise which is similar to that of frog skin does not, per se, vitiate my conclusions. There is nothing implicit in the concept of active transport which requires that all details of its mechanism be unique to a metabolizing biological system.

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Fluid Flow through Small Pores

Dear Sir:

The sole argument presented by Schindler and Iberall (1973, *Biophys. J.* **13**:804) against the validity of continuum hydrodynamic fluid flow in channels of *ca.* 80 Å diameter is misleading. According to Eq. 3 in their paper, which itself is a reasonable estimate of the mean square displacement of a molecule by random diffusion movements in a continuous medium (derived from classical kinetic theory), they calculate that in the time required for a water molecule to flow through a capillary pore 80 Å in diameter and 0.1 μm long (5 ms), its displacement due to diffusion would greatly exceed the pore diameter. They conclude that "interactions [of water molecules] with the pore walls become a dominating feature of the transport" rather than viscous forces imposed by a laminar flow pattern.

In reality, a water molecule moves diffusively in random steps of about 2 Å every 10^{-11} s or less (see, for example, D. Eisenberg and W. Kauzman, 1969, The Structure and Properties of Water, Oxford University Press, Inc., New York, Chap. 4 and references therein). In an 80 Å pore, it will interact many times with other water molecules before it exchanges kinetic energy and momentum with the wall. The proper consideration for judging the applicability of continuum hydrodynamic theory (Poiseuille's Law) to transport through small pores is the ratio of pore diameter to the average molecular displacement per kinetic step, which in condensed phases is of the order of molecular dimensions.

Thus, the argument presented by Schindler and Iberall is specious. Eq. 3 for the mean square displacement of molecules by diffusion incorporates kinetic theory only in that the diffusion constant is given in terms of the Stokes-Einstein relationship. It leads to the conclusion that Poiseuille's Law should not apply to fluid motion through a cylindrical tube 1 mm in diameter, 10 m long under the influence of a 10 cm H_2O (10^4 dyn·cm^{-2}) pressure head, but would be valid for a tube of the same diameter only 1 μm in length. This is contrary to experience.

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